RADIATION CENTER

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November 27, 1990

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Annual Report of Changes, Tests and Experiments Performed Under the Provisions of 10 CFR 50.59 for the Oregon State University TRIGA Reactor (OSTR), License No. R-106, Docket No. 50-243.

The following report is submitted in accordance with the requirements of 10 CFR 50.59(b) and 10 CFR 50.4, and covers the OSTR's annual reporting period of July 1, 1989 through June 30, 1990. The information in this report is compiled annually and is submitted to the USNRC in this specific 10 CFR 50.59(b) report, as well as in a special section of the OSTR annual report, which was submitted on October 31, 1990.

During the specified reporting period there were four changes to the reactor facility and seven changes to the reactor procedures conducted pursuant to 10 CFR 50.59. There were no changes to reactor experiments, no tests, and no new experiments performed under the provisions of 10 CFR 50.59 during the current reporting period.

The individual changes being reported are listed below by category and by title, and are described in more detail in Attachment A. Regarding this attachment, you will note that it includes a brief description of each change followed by a summary of the safety evaluation conducted for the described change. As required, none of the changes performed under the provisions of 10 CFR 50.59 required a change in the OSTR Technical Specifications or involved an unreviewed safety question as defined in 10 CFR 50.59(a)(2).

1. Changes to the Reactor Facility:

   a. Air Flow Annunciators for the Reactor Bay Ventilation System

   b. Replacement of the Annunciator Panel Day/Night Switch

   c. Argon Vent Fan Rewiring

   d. Rotating Rack Annunciator

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2. Changes to Reactor Procedures:

   a. Revision of Oregon State University TRIGA Reactor Operating Procedure (OSTROP) 18 - Encapsulation Requirements

   b. Revisions to the OSTR and Radiation Center Emergency Response Plan - July 1989

   c. Revisions to the OSTR and Radiation Center Emergency Response Plan - October 1989

   d. Revision to the OSTR and Radiation Center Emergency Response Plan - June 1990

   e. Revision of the Reactor Operations Committee Charter and OSTROP 6 - Administrative and Personnel Procedures

   f. Change to OSTROP 10 Relating to Control Rod Calibration and the Cadmium-Lined In-Core Irradiation Tube (CLICIT)

   g. Revisions to the Fuel Element Handling Procedures (OSTROP 11)

We trust that you will find this year's report to be in good order. However, should you require more information or have questions regarding our report, please let me know.

Yours sincerely

A.G. Johnson
Director, Radiation Center

AGJ/jh/ANNREPT.nrc

Enclosure

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ATTACHMENT A

Changes to the OSTR Facility, to Reactor Procedures, and to Reactor Experiments Performed Pursuant to 10 CFR 50.59

The information contained in this section of the report provides a summary of the changes performed during the reporting period under the provisions of 10 CFR 50.59. For each item listed, we have included a brief description of the action taken and a summary of the applicable safety evaluation. **Although it may not be specifically stated in each of the following safety evaluations, all actions taken under 10 CFR 50.59 were implemented only after it was established by the OSTR Reactor Operations Committee (ROC) that the proposed activity did not require a change in the facility's Technical Specifications and did not introduce or create an unreviewed safety question as defined in 10 CFR 50.59(a)(2).**

1. 10 CFR 50.59 Changes to the Reactor Facility

There were four changes to the reactor facility which were reviewed, approved, and performed under the provisions of 10 CFR 50.59 during the reporting period.

a. AIR FLOW ANNUNCIATORS FOR THE REACTOR BAY VENTILATION SYSTEM

(1) Description

Until recently, the method of detecting operating abnormalities or failure of the reactor bay ventilation system was through annunciators linked to the electrical power for the air supply and exhaust fan motors, and through damper annunciators associated with the air-operated ventilation system dampers. The reactor operations staff has supplemented these annunciators by installing air pressure sensors in the air supply and exhaust ducts for the reactor bay ventilation system. The pressure sensors were installed in the ducts in locations where they will detect a significant decrease or total loss of air flow due to any cause. Installation involved drilling a small hole in the supply duct sheet metal and using an existing tap in the exhaust duct. The air pressure sensors and associated switches were connected to the control room annunciator panel so that a lack of flow for any reason will sound and illuminate a "ventilation low flow" annunciator.

(2) Safety Evaluation

There are no negative safety implications associated with the installation of the air pressure sensors and switches. Indeed, they will enhance safety by reducing the already small probability that any ventilation system failures will go unnoticed. The basis for this conclusion stems from the fact that the new pressure switches will detect changes in or loss of ventilation air flow from any cause and not just from a loss of electrical power or a loss of instrument air pressure to the ventilation system dampers.

b. REPLACEMENT OF THE ANNUNCIATOR PANEL DAY/NIGHT SWITCH

(1) Description

In order to put the new "ventilation low flow" annunciator mentioned in D.1.a onto the day/night switch, it was necesary to replace the old switch with a new one which had more contacts. To do this, the switch location on the reactor console also needed to be changed. The old conductivity monitor (which was no longer used) was removed from the left console tower and a new panel was installed. The new day/night switch was installed in this panel. This has the additional advantage of placing the new switch in a more convenient location on the left console side cabinet.

(2) Safety Evaluation

This change of a switch and its location on the console has absolutely no safety implications whatsoever. Even though the original switch was located on the console, it did not interact in any way with any reactor safety circuitry or instrumentation.

c. ARGON VENT FAN REWIRING

(1) Description

The reactor staff had the electrical circuit to the argon vent fan rewired so that if the entire reactor bay ventilation system shuts down, or if only the reactor bay exhaust fan shuts down, the argon vent fan will also stop

automatically. In addition, as part of the rewiring effort the electrical power for the argon vent fan was routed through a timer so that the argon fan will not restart until after a preset interval. During this delay interval, power will first be restored to the reactor building exhaust fan, and this system will be allowed to reach full operating capacity before the argon fan starts.

(2) Safety Evaluation

These facility changes were made to enhance safety, and are part of the Center's commitment to the ALARA program. Ensuring that the argon vent fan automatically stops whenever the entire reactor bay ventilation system shuts down or when the reactor bay exhaust fan shuts down will prevent the undiluted release of any small amounts of argon-41 which may be in the argon ventilation system piping. It will also relieve the reactor operator from having to shut off the argon fan manually in the event of a ventilation system shutdown. In both cases, the amount of argon-41 released during shutdown of the reactor bay ventilation system will be reduced.

Starting the argon vent fan after a preset time delay will ensure that any argon-41 in the argon ventilation system piping will not be drawn out until the reactor bay ventilation system is working at its full capacity. Thus, argon-41 concentrations will continue to be very low at the point of release. In addition, there is already a control room annunciator for the argon vent fan, so the operator is aware of the argon vent fan status at all times.

d. ROTATING RACK ANNUNCIATOR

(1) Description

The reactor operations staff installed an annunciator which will alert the reactor operator if the rotating rack should stop turning. The hardware to initiate the signal for the annunciator consists of:

(a) A permanent magnet attached to the large gear wheel on the rotating rack drive train.

(b) A magnetic-field sensor mounted on the rotating rack drive housing.

(c) An adjustable time-delay receiver that will receive a signal from the magnetic-field sensor.

The time-delay will trigger the annunciator panel if it does not receive a periodic signal from the magnetic-field sensor.

(2) Safety Evaluation

The installed electronic circuit is separate from all other reactor controls and circuits and, therefore, will in no way be detrimental to reactor safety. In fact, it may slightly enhance safety by alerting the reactor operator when (and if) the rack stops rotating. The circuit will only interact with a selected annunciator window. If, for some reason, the circuit should fail, then there will either be a continuous annunciator or no annunciator at all (which is the present arrangement). The correct functioning of the annunciator is automatically tested each time the rotating rack is turned off (approximately daily).

2. 10 CFR 50.59 Changes to Reactor Procedures

There were seven changes to reactor procedures which were reviewed, approved, and performed under the provisions of 10 CFR 50.59 during the reporting period.

a. REVISION OF OREGON STATE UNIVERSITY TRIGA REACTOR OPERATING PROCEDURE (OSTROP) 18--ENCAPSULATION REQUIREMENTS

(1) Description

The reactor operations staff expanded the encapsulation requirements as detailed in OSTROP 18. These requirements were originally written with the rotating rack and the pneumatic transfer system in mind and were, therefore, silent with respect to encapsulation requirements for other facilities. For these reasons, the encapsulation requirements were completely reevaluated.

Instead of one table showing all encapsulation requirements, there are now five individual tables which detail the acceptable encapsulations for each of the OSTR irradiation facilities. In addition, the narrative description of encapsulation requirements, limitations, and other pertinent considerations contained in paragraphs 1) and 2) were slightly revised to accommodate the new tables, and a new paragraph 3) was added regarding specific ROC approval of encapsulations. A new paragraph 4) was also added to indicate that more rigorous encapsulations of a currently approved type may be used in lieu of less stringent polyethylene encapsulation.

(2) Safety Evaluation

It is difficult with such a large revision to specifically discuss every single encapsulation change. Therefore, the principles and philosophy of the changes will be addressed.

The general philosophy of the new encapsulation requirements is that they should be stated in a manner which will give experimenters as much flexibility as possible consistent with the known limitations of the various containers. This philosophy leads to the different categories in the tables.

The decision to split up the original encapsulation table into several different tables which are specific to certain irradiation facilities makes it possible to take into account factors such as neutron and gamma flux levels, neutron spectra, the temperature in the various irradiation facilities, and methods commonly used to handle irradiated samples. This added detail enhances safety in that it enables the encapsulation to be more specifically tailored to the type of facility rather than to some generic standard. For example, it was recognized that it was not always desirable in order to ensure containment using polyethylene vials, to allow irradiations longer than about 10 to 12 minutes in the rabbit facility when the reactor was at high power levels (e.g., 500 to 1000 kW) and cadmium covers were being used. Therefore, there is now a 100 kWh limit for polyethylene encapsulated, cadmium-covered samples in the rabbit.

The second general principle used in the reevaluation was that stable solid materials generally need only one level of containment, whereas liquids, powders and similar loose materials need two levels of containment. In this manner, containment appropriate to the material or substance being irradiated is achieved. However, with respect to this policy it should also be noted that in almost every case the containment specifications are in addition to the extra containment provided by the standard TRIGA tubes or by the rabbit tubes used to hold the encapsulated samples during irradiation.

For the rotating rack and pneumatic transfer facilities, the desired integrated neutron flux also affects the encapsulation requirements. Experience and testing has shown that there are limits to the capabilities of the various sizes of polyethylene vials used in these facilities. Therefore, these limitations are build into the new tables.

The final factor considered was whether or not cadmium covers will be used. The heating the extra gamma flux associated with the use of cadmium covers degrades polyethylene vials and, therefore, encapsulation is more restrictive when cadmium is used.

There are no known limitations to quartz and aluminum encapsulations; however, an administrative limit of 35 MWh has been chosen for routine approval. If needed, a greater irradiation time may be approved through the "Other Encapsulation Methods" option.

A new paragraph 3) has been added which allows for variances from these encapsulation requirements if the experiment has gone through the ROC approval procedure described in OSTROP 18.5. This does not reduce safety in any way because the experiment approval procedure requires specific ROC approval and is, therefore, even more rigorous.

A new paragraph 4) has also been added, and simply clarifies that more rigorous forms of currently approved encapsulations may be used in lieu of polyethylene. The only possible impact this can have is to enhance safety.

In conclusion, all of the encapsulation changes were made according to the philosophy and principles outlined above. In this manner, it is felt that each new table describes appropriate and safe levels of containment described in the tables are based on actual experience in use and/or testing, and have been found to prevent radioactive material release under the stated conditions of use.

b. REVISIONS TO THE OSTR AND RADIATION CENTER EMERGENCY RESPONSE PLAN--JULY 1989

(1) Description

In response to a previous amendment to the OSTR emergency plan, the USNRC required an amendment to revise the line of succession for the Senior Health Physicist (SHP) position. It was the Commission's opinion that the Radiation Center Director should not be included in the SHP line of succession. Hence, the position of Reactor Operator was substituted for the RC Director. Other changes included: adding the OSU Office of Environmental Health and Safety to the list of support agencies, updating the administrative title for the Public Information Officer to Assistant Vice President for University Relations, and including a typed version of Figure 3.2.

(2) Safety Evaluation

The aforementioned changes do not decrease the effectiveness of the emergency response plan. With respect to the SHP line of succession, the Reactor Operator is the most acceptable choice to replace the RC Director when considering the available staff members and their current commitments to the emergency response plan. The Reactor Operator position is regularly trained and examined in the topics of radiation protection and emergency

response and consequently can fulfill the basic responsibilities of Senior Health Physicist.

The addition of the OSU Environmental Health and Safety office increases the effectiveness of the plan by including additional, skilled personnel who may be able to help in specific situations. The administrative title change and the typing of Figure 3.2 clearly do not decrease the effectiveness of the plan.

c. REVISIONS TO THE OSTR AND RADIATION CENTER EMERGENCY RESPONSE PLAN--OCTOBER 1989

(1) Description

As a result of the annual review of the emergency response plan on September 29, 1989, it was decided to make a number of small changes in the OSTR and Radiation Center Emergency Response Plan. These changes are detailed below.

Front Cover - The last revision date was updated.

Page 1-2 - The typographical error in the spelling of "service" was corrected.

Page 3-3 - Under the heading "City of Corvallis Police Department", the sentence from "The City of Corvallis Police Department will be involved in emergency..." was changed to "The City of Corvallis Police Department could be involved in an emergency..."

Page 3-14 - The diagram on the interface of the various on and off-site emergency organizations was updated to include the OSU Department of Environmental Safety, the name of OSU Campus Security was changed to OSU Campus Police and

Security and the Federal Radiological Monitoring and Assessment Plan box was changed to Federal Emergency Management Agency (FRMAP).

Changes were also made to the Emergency Response Plan Implementing Procedures to update telephone numbers, and allow for personnel turnover.

(2) Safety Evaluation

There are clearly no safety implications of any of the changes to the emergency plan, as they do not affect any response actions. Most of the changes merely were made to keep the plan current. The City of Corvallis Police will not necessarily always respond to an emergency as the OSU Police now have increased capabilities and will normally be asked to respond to any significant emergencies.

d. REVISION TO THE OSTR AND RADIATION CENTER EMERGENCY RESPONSE PLAN--June 1990

(1) Description

It was determined that the decontamination equipment maintained at the OSU Student Health Center was no longer a necessary part of the existing emergency response plan for the OSU TRIGA reactor and Radiation Center. Therefore, the emergency response plan was revised in order to delete all references to the Student Health Center decontamination facility. Other minor changes to the plan were needed to correct a typing omission, to change the name of the OSU Department of Information and to update the plan to ensure that it was consistent with other reactor procedures. All of these changes are detailed below.

Page 3-4 The sentence under Good Samaritan Hospital beginning: "Arrangements have also been made..." was deleted.

Page 3-5 — The section headed: "OSU Student Health Service" was deleted.

The words "Department of Information" was changed to "News and Communication Services" in two locations.

Page 3-10 — The words "Director of the OSU Department of Information" were changed to "Assistant Vice-President for University Relations" in the first paragraph.

Page 3-14 — That section of Figure 3.2 which shows the OSU Student Health Center was deleted.

"Department of Information" was changed to "News and Communication Services".

Page 7-3 — All of the μ prefixes associated with airborne radioactivity concentrations were inadvertently omitted on this page. Therefore, this page was reissued with the μ prefixes inserted.

Page 7-10 — Section 7.2.4.i).i) -- The last sentence: "This information is indicated on a personnel status board maintained in the control room." was deleted.

Page 8-6 — Paragraph 8.3.2.c) was replaced with: "Injured personnel will normally be decontaminated and then dispatched to the Good Samaritan Hospital."

Page 8-7 Paragraph 8.3.3.c) was replaced with: "In the event that these showers are not accessible or available, there are further personnel decontamination facilities at the Good Samaritan Hospital."

Paragraph 8.3.4.b) was deleted and subsequent paragraphs renumbered.

Page 10-1 The wording "and OSU Student Health Center" was deleted from paragraph 10.1.b).iv).

Page 10-3 The wording "Student Health Service decontamination room and those in the" from paragraph 10 4.2.c) was deleted.

Page 10-4 Section 10.4.2.e) was changed to read: "The emergency evacuation horns are functionally tested each quarter."

Paragraph 10.4.3.b) was deleted and the following paragraph renumbered.

Section 10.4.3.c) was changed from "annually" to "semi-annually".

Page B-1 Section B.2.b) was deleted and subsequent sections renumbered.

Pages B-2 through B-14

These pages were replaced with a revised example of the inventory checklist which did not reference the Student Health Center.

(2) Safety Evaluation

A recent reevaluation of the procedures to be used in the event of personnel injury involving contamination highlighted the fact that virtually no use would be made of the facility at the OSU Student Health Center. There are many decontamination facilities at the Radiation Center which would be used in preference to the Student Health Center. If these were unavailable due to the nature of the accident or if injuries requiring immediate medical attention were involved, then the facilities which have been established at the Good Samaritan Hospital would normally be used. In addition, the decontamination kits which are maintained in the Corvallis Fire Department's Hazmat vehicle would also be available if needed. Therefore, it was concluded that the OSU Student Health Center's decontamination facility could be decommissioned with no reduction in the effectiveness of the existing emergency plan. Appropriate changes to the plan were made to implement this conclusion.

The revisions to the plan relating to the Department of Information's name change to News and Communication Services have no safety implications whatsoever. All of the expected responses remain the same.

The change to page 7-3 was merely correcting a typing omission which occurred when the page was revised. The plan itself, the alarm set points and the detection limits were not actually changed, so clearly there are no safety implications associated with this correction. Airborne concentration action levels in the plan and in the implementing procedures were, and are, still correct.

The personnel status board referred to on page 7-10 had not proven to be necessary and, therefore, it was felt that its use could be discontinued. Because there is normally only one or two people in the reactor bay at any one time, the reactor operator can easily keep track of where they are. During classes, the escorting instructor is responsible for the evacuation of

his students if required. It is felt that this change does not reduce the effectiveness of the emergency plan or compromise safety in any way.

Initial difficulties with the condition of the evacuation horn batteries resulted in a switch to monthly routine maintenance of the batteries and monthly testing of the horns. After several years of experience, it was determined that the horn testing frequency could be reduced to quarterly, with no loss of confidence in the horns' ability to function when needed. This is largely due to the fact that the evacuation horn battery maintenance will remain on a monthly frequency. Again, it is felt that this change does not reduce the effectiveness of the emergency response plan.

The final change in the emergency plan on page 10-4 reflected the fact that the emergency equipment inventories at various locations are now checked on a semiannual rather than an annual basis. This is clearly an improvement in the plan.

e. REVISION OF THE REACTOR OPERATIONS COMMITTEE CHARTER AND OSTROP 6--ADMINISTRATIVE AND PERSONNEL PROCEDURES

(1) Description

As a result of the annual review of the Reactor Operations Committee (ROC) Charter, the reactor staff made one minor revision to section II.2 of the ROC Charter and to the corresponding wording from the charter which is contained in section 6.4.B.2 of OSTROP 6. Additional wording was inserted after the existing statement that "All members shall have equal voting rights and responsibilities." The new wording added the phrase, "In situations where a committee member has a conflict of interest, it shall be committee policy that the individual abstain from voting on the issue."

(2) Safety Evaluation

Addition of the conflict of interest statement has no direct relationship to any specific safety issue and certainly does not introduce any new or unreviewed

safety questions. Any safety-related impact of the new statement is only positive and thus enhances safety by removing any non-objective voting which might potentially occur in the presence of a conflict of interest.

f. CHANGE TO OSTROP 10 RELATING TO CONTROL ROD CALIBRATION AND THE CADMIUM-LINED IN-CORE IRRADIATION TUBE (CLICIT)

(1) Description

OSTROP 10.7.B.6 stated that if the control rods have been recalibrated since the CLICIT was last used, and if, as a result of the calibration, the worth of any rod changed by more than 2 cents, then all of the rods must be recalibrated with the CLICIT in the core before the CLICIT could be used. It was recognized that this limitation was not needed and could be relaxed without compromising safety or without conflicting with the OSTR Technical Specifications. Therefore, this section of OSTROP 10 was eliminated and 10.7.B.7 was renumbered to 10.7.B.6.

(2) Safety Evaluation

Technical Specification 4.3.1 only requires that the reactivity worth of each control rod and the shutdown margin (SDM) be measured annually and following significant core or control rod worth changes. Therefore, calibrating the rods once each year, with and without the CLICIT in the core, will meet this requirement.

The only time the control rod worth curves are used for routine steady state operation is in the determination of the core excess and the SDM to ensure that the SDM remains greater that $0.57. It is clear that if the reactor has sufficient SDM without the CLICIT installed, then because the CLICIT adds only negative reactivity, there will be more than sufficient SDM with it in the core. Hence, there are no safety, license or operational needs to recalibrate the control rods with the CLICIT in the core more frequently than required by the Technical Specifications (i.e., once a year, or after other significant core or control rod changes).

g. REVISIONS TO THE FUEL ELEMENT HANDLING PROCEDURES (OSTROP 11)

(1) Description

It was recently recognized that OSTROP 11 addressed the insertion and removal of the sample-holding dummy fuel element, but did not address the insertion and removal of the cadmium-lined in-core irradiation tube (CLICIT). The purpose of this change was to incorporate necessary fuel handling procedures associated with the use of each of these devices in the same section of OSTROP 11, namely section D.2.

(2) Safety Evaluation

This change updated the OSTR fuel element handling procedures, and therefore, contributes to increased safety by generating additional written procedures which supplement those presently in place. The fuel handling procedure for insertion and removal of the CLICIT is the same as that approved for the sample-holding dummy fuel element, and this procedure has been used for many years with no difficulty. This procedural change does not in any way change the authorization process for fuel element movement. Therefore, use of the revised procedures still requires the normal review and authorization detailed in other sections of OSTROP 11.

3. 10 CFR 50.59 Changes to Reactor Experiments

There were no changes to reactor experiments during this reporting period.